

1 CLAIMS

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- 3 1. A circuit arrangement for deriving phase
4 conjugation information from a main input signal
5 of a given frequency comprising:
6 an input receiving a reference input signal;
7 and
8 a phase locked loop (PLL) circuit comprising
9 an oscillator having a main output signal, an
10 input receiving a PLL input signal, an input
11 receiving a feedback signal from the oscillator
12 and a phase detecting means,
13 wherein the phase detection means detects any
14 phase difference between the PLL input signal
15 and the feedback signal and provides a phase
16 control signal to the oscillator.
17
- 18 2. A circuit as claimed in claim 1, wherein a first
19 heterodyne mixer mixes the main input signal and
20 the main output signal to provide the feedback
21 signal and the PLL input signal is the reference
22 input signal.
23
- 24 3. A circuit as claimed in claim 2, wherein the
25 feedback signal is the up-converted mixing
26 product of the first heterodyne mixer.
27
- 28 4. A circuit as claimed in claim 3, wherein the
29 frequency of the reference input signal is
30 scaled to match the frequency of the feedback
31 signal.
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1 5. A circuit as claimed in any preceding claim,
2 wherein the feedback signal is scaled.

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4 6. A circuit as claimed in any preceding claim,
5 wherein the phase detection means is a digital
6 phase detector.

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8 7. A circuit as claimed in any of claims 1 to 5,
9 wherein the phase detection means also detects
10 any phase difference between an input receiving
11 the main output signal and an input receiving
12 the reference signal thereby creating a further
13 phase locked loop.

14

15 8. A circuit as claimed in claim 7, wherein the
16 phase detection means comprises:
17 a first phase detector which detects any phase
18 difference between an input receiving the
19 reference input signal and an input receiving
20 the feedback signal;
21 a second phase detector which detects any
22 phase difference between an input receiving the
23 reference input signal and an input receiving
24 the main output signal;
25 an integrator integrating the first phase
26 detector output;
27 an oscillator heterodyne mixer for mixing the
28 integrator output and the second phase detector
29 output;
30 wherein the oscillator mixer output is the
31 phase detection means output providing a control
32 signal for the oscillator.

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2 9. A circuit as claimed in any of claims 1 to 5,
3 wherein the phase detection means comprises:
4 a first phase detection heterodyne mixer
5 mixing an input receiving the reference input
6 signal and an input receiving the feedback
7 signal and having a first phase detection mixer
8 output wherein the first mixer output is the
9 down-converted mixing product of the first
10 mixer;
11 a second phase detection heterodyne mixer
12 mixing an input receiving the reference input
13 signal and an input receiving the first phase
14 detection mixer output and having a second phase
15 detection mixer output wherein the second phase
16 detection mixer output is the down-converted
17 mixing product of the second phase detection
18 mixer and the phase detection means output
19 providing a control signal for the oscillator.
20
- 21 10. A circuit as claimed in claim 1, wherein a
22 feedback heterodyne mixer mixes an input
23 receiving the main output signal and an input
24 receiving the reference input signal, the
25 feedback signal is the down-converted mixing
26 product of the feedback heterodyne mixer and the
27 PLL input signal is the main input signal, the
28 feedback signal being proportional to the main
29 input signal.
30
- 31 11. A circuit as claimed in claim 10, wherein the
32 main input signal is scaled by a first divider,

1 the main output signal is scaled by a second
2 divider and the feedback signal scaled by a
3 third divider, the first divider having a
4 scaling value equal to the product of the second
5 and third divider scaling values.

6
7 12. A circuit as claimed in claim 1, wherein an input
8 heterodyne mixer mixes the main input signal and
9 the reference input signal, the PLL input signal
10 is the down-converted mixing product of the
11 input heterodyne mixer and the feedback signal
12 is the main output signal, the main input signal
13 and the main output signal having substantially
14 equal frequencies.

15
16 13. A circuit as claimed in claim 12, wherein a first
17 divider scales the main input signal, a second
18 divider scales the main output signal, the first
19 divider having a scaling value equal to the
20 second divider scaling value.

21
22 14. A circuit as claimed in any preceding claim,
23 wherein the oscillator is a voltage controlled
24 oscillator (VCO).

25
26 15. A method of deriving phase conjugation
27 information from an input signal, the method
28 comprising detecting phase difference in a phase
29 locked loop (PLL) circuit between a feedback
30 signal having a first frequency and a PLL input
31 signal of a second frequency which is
32 proportional to the first frequency.

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